Endangered Species Act - Section 7
Consultation

Biological Opinion
on
Effects of Issuance of License for McKenzie (Bigelow) Hydropower Project on
Upper Willamette River Chinook Salmon, its Proposed Critical Habitat, and Bull Trout

Action Agency: Federal Energy Regulatory Commission

Consultation Conducted Jointly By:

National Marine Fisheries Service, Northwest Region
and
U. S. Fish and Wildlife Service, Pacific Region

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I. Background

On March 24, 1999, the National Marine Fisheries Service (NMFS) published its final decision to list the Upper Willamette River evolutionarily significant unit (ESU) of chinook salmon as threatened under the Endangered Species Act (ESA). The effective date for the final listing was May 24, 1999, and the ESU is defined as "all naturally spawned populations of spring-run chinook salmon residing below impassable natural barriers" (64 FR 14308). Critical habitat for this ESU was proposed on March 9, 1998 (63 FR 11482), and this proposed designation is still pending at the time of this Biological Opinion. Upper Willamette River chinook salmon occur within the action area of this consultation. The Upper Willamette River steelhead ESU was listed as threatened under the ESA (64 FR 14517; March 25, 1999) simultaneously with Upper Willamette River chinook salmon, but its range does not include the action area for this consultation , and it is not addressed in this Biological Opinion.

The U.S. Fish and Wildlife Service (USFWS) determined threatened status for the Columbia River distinct population segment (DPS) of bull trout (Salvelinus confluentus) on June 10, 1998 (63 FR 31674). Critical habitat has not been proposed or designated. The Columbia River DPS includes bull trout in portions of Oregon, Washington, Idaho, and Montana, which encompasses the Willamette River and its tributaries. On November 1, 1999, the USFWS determined threatened status for all bull trout populations within the coterminous United States (64 FR 58910). For purposes of consultation under section 7 of the ESA, the USFWS has retained recognition of each DPS in light of available scientific information relating to their uniqueness and significance. Under this approach, these DPS's will be treated as interim recovery units with respect to application of the jeopardy standard until an approved recovery plan is developed.

Coastal cutthroat trout (Oncorhynchus clarki clarki) in the upper Willamette River is currently a candidate for listing under the ESA.

A. Objective of this Consultation

Section 7(a)(2) of the ESA requires each Federal agency in consultation with NMFS and USFWS (the Services), to ensure that any action it authorizes, funds, or carries out, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. Conferencing is required for proposed species when the action agency determines that its action is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat. There is no requirement to confer on candidate species.

The Federal Energy Regulatory Commission (FERC) has proposed to license the existing McKenzie hydroelectric project (FERC No. 11512) in the upper McKenzie River Subbasin (the "proposed action"), and has requested formal consultation from the Services due to effects of the project on Upper Willamette River chinook salmon (UW chinook salmon) and the Columbia River distinct population segment of bull trout (bull trout). This small project is located on the upper McKenzie River near McKenzie Bridge, and it is owned and operated by Mr. John Bigelow.

Despite being in operation for over 30 years, this hydroelectric project has never had a license from FERC. In 1989, FERC asserted jurisdiction over the project and informed Mr. Bigelow that he would be required to obtain a license under the Federal Power Act from FERC to continue operating the project. Mr. Bigelow submitted his application for a hydroelectric license on December 27, 1994, in which he proposed a number of modifications to the existing facility. He then amended the application on December 19, 1995, and again on September 2, 1997, resulting in the removal of the project modifications he had proposed in the 1994 license application.

The objective of this Biological Opinion is to address the effects of providing Mr. Bigelow a license to operate the McKenzie project, as proposed by FERC, on listed UW chinook salmon and bull trout, and to determine if this federal action by FERC will jeopardize the continued existence of either species. It will also serve as a conference opinion on the effects of the proposed action on proposed UW chinook salmon critical habitat. Until FERC issues a license for the McKenzie project incorporating the reasonable and prudent measures of this Biological Opinion, the existing project has no authorization for take of listed species.

B. Consultation History

For the past several years, NMFS has worked with Mr. Bigelow by providing suggestions for improving juvenile fish screens for the project (e.g., NMFS' January 6, 1993, letter to Mr. Bigelow and NMFS' June 14, 1994, letter to Mr. Bigelow's consultant, Ms. Drought). On November 26, 1997, NMFS provided FERC its Federal Power Act section 10(j) recommendations for this project, and reserved its right to revise recommendations and license conditions prior to licensing or construction. On July 10, 1998, FERC issued a draft Environmental Assessment (draft EA) on its proposed issuance of a license for the project. On June 3, 1999, FERC requested formal consultation from NMFS on this proposed action for UW chinook salmon, and used the draft EA as the Biological Assessment (BA) for this consultation. On July 15, 1999, NMFS notified FERC that the BA it had provided was not adequate for the consultation, and requested additional information. FERC responded on August 5, 1999, with all of the information it had available. The lack of a final design plan for the project prevented NMFS from proceeding with formal consultation. NMFS discussed the issue with the USFWS and the Oregon Department of Fish and Wildlife, and on September 1, 1999, sent a letter to FERC providing assumptions about the project's final design under which a consultation could be completed. FERC responded on September 20, 1999, agreeing with these assumptions (with the minor extension of NMFS' suggested timeframe of one year for fish screen installation to 18 months), and formal consultation was initiated.

In a letter dated August 21, 1998, USFWS responded to FERC's draft EA, concluding that it could not concur with FERC's determination that the proposed action was not likely to adversely affect bull trout. FERC responded to USFWS on September 16, 1998, with a request for formal consultation on the project. USFWS replied to FERC on October 17, 1998, requesting additional details on the project's design. FERC responded again on December 30, 1998, by reiterating that all available projects details had been provided to USFWS. The lack of a final design plan for the project prevented the USFWS from proceeding with formal consultation. The USFWS discussed the issue with NMFS and the Oregon Department of Fish and Wildlife, and on September 2, 1999, sent a letter to FERC providing assumptions about the project's final design under which a consultation could be completed. FERC responded on September 28, 1999, agreeing with these assumptions (with the minor extension of the suggested timeframe of one year for fish screen installation to 18 months), and formal consultation was initiated.

II. Existing Project and Proposed Action

A. Existing Project

The McKenzie Project is an existing unlicensed operating hydroelectric facility, located at river mile 73.5 on the upper McKenzie River near McKenzie Bridge, Lane County, Oregon. The project has an installed capacity of 76 kilowatts (kW) and operates on approximately 41 cubic feet per second (cfs). When originally constructed, the project consisted of a small diversion dam, a wooden and concrete tainter gate, a power canal, a penstock, and a powerhouse. The diversion dam consisted of large boulders and logs that aided in diverting water from a side channel of the McKenzie River into the head of the power canal, which is equipped with a wooden and concrete tainter gate to regulate flow. However, in 1993 a spring flood moved the diversion dam and it no longer functions as intended, but water still flows into the power canal from the side channel naturally. The manually controlled tainter gate is operational but ineffective at regulating the flow due to the absence of the diversion dam.

The McKenzie Project is a run-of-river operation. Water flowing through the tainter gate enters the 1,500-foot long power canal, which is separated from the main channel by a vegetated island. The power canal varies from 20 to 100 feet wide and 2 to 4 feet deep. Approximately two-thirds of the way down the power canal there is a concrete emergency spillway measuring 30 feet by 30 feet that allows excess water during high flows to return to the main channel rather than over the penstock and powerhouse. The power canal leads to, and ends at, the 32-foot long, 5-foot diameter penstock, which drops the water over the approximately 18 to 20 feet of head into the powerhouse. The powerhouse is equipped with a single 26-inch Francis-type turbine that takes a maximum of 41 cfs, and it is rated at 76 kW with an average capacity of 40 kW. The powerhouse discharges water through a draft tube under the turbine into a 30-foot long by 8-foot wide tailrace. Currently, the project is not equipped with fish passage facilities of any kind (i.e., no fish screens or bypass system for juveniles moving downstream, and no tailrace barrier to prevent adults moving upstream from swimming into the tailrace and on into the draft tube).

B. Proposed Action

Mr. Bigelow submitted his application for a license on December 27, 1994, that included: (1) rebuilding the diversion dam; (2) installation of a fish screen and bypass; (3) annual removal of sediment in front of the headgate; and (4) placement of an adult fish barrier in the tailrace. On September 2, 1997, Mr. Bigelow amended his application to delete the proposal to: (1) Rebuild the diversion dam; (2) annually remove sediment in front of the headgate; and (3) place an adult fish barrier in the tailrace. The results of these modifications to the license application are that Mr. Bigelow would continue to operate the project as it is currently being operated, and to install a fish screen and fish bypass system.

FERC proposes in its BA to issue an original hydroelectric power license authorizing the continued operation and maintenance of the McKenzie project, and including the following measures: (1) operation of the project in continuous run-of-river mode; (2) design, installation, operation, and maintenance of a downstream fish bypass facility; (3) development and performance of a study evaluating the effectiveness of the downstream fish bypass; (4) installation of a tailrace barrier to exclude adult fish from the turbine; (5) development of a construction plan for mitigating impacts associated with construction of the downstream fish bypass and tailrace barrier; and (6) protection of any archeological or historic sites discovered during project operation and maintenance. Hydropower licenses under the Federal Power Act are issued by FERC for a period of up to 50 years.

FERC included conceptual drawings of the proposed downstream fish passage and tailrace barrier facilities in its August 5, 1999, additional information response to NMFS. However, FERC is not able to provide basic details of these proposed facilities (such as dimensions) because the applicant, Mr. Bigelow, has not developed them. In letters to NMFS and USFWS on September 20, 1999, and September 28, 1999, respectively, FERC agreed with the Services' assumptions that the final project design for fish bypass facilities would conform to the screening and passage criteria for juvenile salmonids recommended by NMFS at the time the project is implemented. NMFS' current screening and passage criteria specify acceptable structure placement, approach velocity, sweeping velocity, screen face material, civil works and structural features, bypass layout, bypass entrance, bypass conduit design, bypass outfall, and operations and maintenance (Attachment 1). Plans for the construction of the fish passage and tailrace barrier facilities will minimize, to the maximum extent possible, the effects of construction on UW chinook and bull trout. These plans will be submitted to the Services for review and approval before the construction of the project is initiated. FERC agreed that the license for the Bigelow project would require fish screening and bypass facilities to be constructed within 18 months of the issuance of the FERC license, and that the project would include habitat enhancement in the power canal, as recommended by the Oregon Department of Fish and Wildlife (ODFW).

III. Listed Species and Critical Habitat

A. Listed Species

1. UW Chinook Salmon

The only NMFS-listed species in the action area is UW chinook salmon, and detailed information on this ESU is provided in the status review of West Coast chinook salmon prepared by Myers et al. (1998), incorporated herein by reference. The UW chinook salmon ESU is defined as “all naturally spawned populations of spring-run chinook salmon residing below impassable natural barriers” (64 FR 14308), thus this section does not include descriptions of hatchery production of spring chinook nor any aspect of fall chinook production or biology in the Willamette Basin.

Aspects of the life history of UW chinook salmon are discussed in the NMFS status review for West Coast chinook salmon (Myers et al. 1998). Adult UW chinook salmon enter the Columbia River in late winter through early spring (i.e., February through April), and enter the lower Willamette River beginning in February. The run peaks in April at Willamette Falls, with passage through the Willamette River above Willamette Falls occurring primarily from late April through July (Myers et al. 1998, Willis et al. 1995). UW chinook salmon begin to enter the McKenzie River as early as mid to late April when water temperatures begins to reach 52-54°F. Most of these pre-spawners hold in pools of cool water between Hayden Bridge and Leaburg Dam until spawning time in the fall, but a significant proportion also migrate past Leaburg Dam in the early summer to hold in the upper river until spawning. The upper watershed (above Leaburg Dam) is managed by ODFW as a natural production area by minimizing the escapement of hatchery produced adults above the dam.

UW chinook salmon spawning in the McKenzie River formerly began in mid August and lasted as late as the third week of October (Willis et al. 1995). It is now largely confined to September, but may extend into mid October. UW chinook salmon fry emergence occurred in February through March under normal, historical conditions. Elevated water temperatures during the fall below Cougar Dam in the South Fork McKenzie River, which accelerate embryonic development, have resulted in emergence occurring as early as December (U.S. Army Corps of Engineers [USACE] 1995, 1998).

Mainstem areas of large Willamette River tributaries (e.g., McKenzie, Santiam, Clackamas Rivers) where UW chinook salmon reproduce naturally in the Willamette Basin are very important for rearing habitat. The upper mainstem of the Willamette River itself may also be important for rearing (Willis et al. 1995). Murtagh et al. (1992) note that juvenile UW chinook salmon in the Clackamas River do not appear to use the tributaries as rearing areas. Studies by Everest et al. (1987) in Fish Creek, as an example, showed that most fry emigrate to the Clackamas River soon after emergence. Zakel and Reed (1984) observed the same type of behavior among UW chinook salmon juveniles in the McKenzie River.

In the McKenzie River, UW chinook salmon begin to drift into downstream rearing habitat in the lower mainstem or in the upper Willamette River as early as one month after emergence. Life history strategies include rearing in lower tributaries of the McKenzie or in the McKenzie mainstem for from three to 16 months. Three major periods of juvenile emigration occur in the McKenzie River. Based on migration patterns averaged over the period 1986-92 from data collected by Eugene Water and Electric Board at Leaburg Dam, fry emigrate to rearing habitat downstream in January through March, shortly after emergence. Subyearling smolts (i.e., ocean-type life history) emigrate primarily in October through December. Yearling smolts emigrate from the McKenzie River during their second spring in March and April (Willis et al. 1995).

Samples collected at various locations within the McKenzie Subbasin between 1948 and 1968 showed that fry migration historically occurred from March through June, several months later than under current conditions of January through March. Likewise, subyearling smolt migrations that now peak in October and November historically occurred in January through March. Changes in juvenile migration timing may be due to the release of warm water from impoundments above spawning areas during the fall incubation period, and consequent acceleration of fry emergence and movement (USACE 1995, 1998).

2. Bull Trout

Bull trout populations are known to exhibit four distinct life history forms: resident, fluvial, adfluvial, and anadromous. Resident bull trout spend their entire life cycle in the same (or nearby) streams in which they were hatched. Fluvial and adfluvial populations spawn in tributary streams where the young rear from one to four years before migrating to either a lake (adfluvial) or a river (fluvial) where they grow to maturity (Fraley and Shepard 1989). Anadromous bull trout spawn in tributary streams, with major growth and maturation occurring in the ocean.

The historic range of the bull trout spanned seven states (Alaska, Montana, Idaho, Washington, Oregon, Nevada, and California) and two Canadian Provinces (British Columbia and Alberta) along the Rocky Mountain and Cascade Mountain ranges (Cavender 1978). In the United States, bull trout occur in rivers and tributaries throughout the Columbia Basin in Montana, Idaho, Washington, Oregon, and Nevada, as well as the Klamath Basin in Oregon, and several cross-boundary drainages in extreme southeast Alaska. In California, bull trout were historically found in only the McCloud River, which represented the southernmost extension of the species' range. Bull trout numbers steadily declined after completion of McCloud and Shasta Dams (Rode 1990). The last confirmed report of a bull trout in the McCloud River was in 1975, and the original population is now considered to be extirpated (Rode 1990).

Bull trout distribution has been reduced by an estimated 40 to 60 percent since pre-settlement times, due primarily to local extirpations, habitat degradation, and isolating factors. The remaining distribution of bull trout is highly fragmented. Resident bull trout presently exist as isolated remnant populations in the headwaters of rivers that once supported larger, more fecund migratory forms. These remnant populations have a low likelihood of persistence (Reiman and McIntyre 1993). Many populations and life history forms of bull trout have been extirpated entirely.

Highly migratory, fluvial populations have been eliminated from the largest, most productive river systems across the range. Stream habitat alterations restricting or eliminating bull trout include obstructions to migration, degradation of water quality, especially increasing temperatures and increased amounts of fine sediments, alteration of natural stream flow patterns, and structural modification of stream habitat (such as channelization or removal of cover).

In Oregon, bull trout were historically found in the Willamette River and major tributaries on the west side of the Oregon Cascades, the Columbia and Snake Rivers and major tributaries east of the Cascades, and in streams of the Klamath basin (Goetz 1989). Currently, most bull trout populations are confined to headwater areas of tributaries to the Columbia, Snake, and Klamath rivers (Ratliff and Howell 1992). Major tributary basins containing bull trout populations include the Willamette, Hood, Deschutes, John Day, and Umatilla (Columbia River tributaries), and the Owyhee/Malheur, Burnt/Powder, and Grande Ronde/Imnaha Basins (Snake River tributaries). Of these eight major basins, large fluvial migratory bull trout are potentially stable in only one, the Grande Ronde, and virtually eliminated from the remaining seven, including the majority of the mainstem Columbia River. The only known increasing population of bull trout is an adfluvial migrant population located in Lake Billy Chinook, that spawns and rears in the Metolius River and tributaries in the Deschutes Basin. In recognition of the precarious status of Oregon bull trout populations, harvest of bull trout is prohibited in all state waters with the exception of Lake Billy Chinook and Lake Simtustus in the Deschutes River Basin.

Juvenile bull trout average 50-70 mm (2-3 in) in length at age 1, 100-120 mm (4-5 in) at age 2, and 150-170 mm (6-7 in) at age 3 (Pratt 1992). Juveniles have a slender body form and exhibit the small scalation typical of char. The back and upper sides are typically olive-green to brown with a white to dusky underside. The dorsal surface and sides are marked with faint pink spots. They lack the worm-like vermiculations and reddish fins commonly seen on brook trout (Salvelinus fontinalis). Spawning bull trout, especially males, turn bright red on the ventral surface with a dark olive-brown back and black markings on the head and jaw. The spots become a more vivid orange-red and the pectoral, pelvic, and anal fins are red-black with a white leading edge. The males develop a pronounced hook on the lower jaw. Bull trout have an obvious "notch" on the end of the nose above the tip of the lower jaw.

Bull trout spawn in the fall, primarily in September or October when water temperatures drop below 9?C (48?F). Typically, spawning occurs in gravel, in runs or tails of spring-fed pools. Adults hold in areas of deep pools and cover and migrate at night (Pratt 1992). After spawning, adfluvial adults return to the lower river and lake.

Bull trout eggs require very cold incubation temperatures for normal embryonic development (McPhail and Murray 1979). In natural conditions, hatching usually takes 100 to 145 days and newly-hatched fry, known as alevins, require 65 to 90 days to absorb their yolk sacs (Pratt 1992). Consequently, fry do not emerge from the gravel and begin feeding for 200 or more days after eggs are deposited (Fraley and Shepard 1989), usually in about mid-April.

Fraley and Shepard (1989) reported that juvenile bull trout were rarely observed in streams with summer maximum temperatures exceeding 15?C (59?F). Fry, and perhaps juveniles, grow faster in cool water (Pratt 1992). Juvenile bull trout are closely associated with the substrate, frequently living on or within the streambed cobble (Pratt 1992). Along the stream bottom, juvenile bull trout use small pockets of slow water near high velocity, food-bearing water. Adult bull trout, like the young, are strongly associated with the bottom, preferring deep pools in cold water rivers, as well as lakes and reservoirs (Thomas 1992).

Juvenile adfluvial fish typically spend one to three years in natal streams before migrating in spring, summer, or fall to a large lake. After traveling downstream to a larger system from their natal streams, subadult bull trout (age 3 to 6) grow rapidly but do not reach sexual maturity for several years. Growth of resident fish is much slower, with smaller adult sizes and older age at maturity.

Juvenile bull trout feed primarily on aquatic insects (Pratt 1992). Subadult bull trout rapidly convert to eating fish and, as the evolution of the head and skull suggest, adults are opportunistic and largely nondiscriminating fish predators. Historically, native sculpins (Cottus spp.), suckers (Catostomus spp.), and mountain whitefish (Prosopium williamsoni) were probably the dominant prey across most of the bull trout range. Today, throughout most of the bull trout's remaining range, introduced species, particularly kokanee (Oncorhynchus nerka) and yellow perch (Perca flavescens), are often key food items (Pratt 1992).

Bull trout are habitat specialists, especially with regard to preferred conditions for reproduction. While a small fraction of available stream habitat within a drainage or subbasin may be used for spawning and rearing, a much more extensive area may be utilized as foraging habitat, or seasonally as migration corridors to other waters. Structural diversity is a prime component of good bull trout rearing streams (Pratt 1992). Several authors have observed highest juvenile densities in streams with diverse cobble substrate and low percentage of fine sediments (Shepard et al. 1984, Pratt 1992).

Persistence of migratory life history forms and maintenance or re-establishment of stream migration corridors is crucial to the viability of bull trout populations (Reiman and McIntyre 1993). Migratory bull trout facilitate the interchange of genetic material between populations, ensuring sufficient variability within populations. Migratory forms also provide a mechanism for reestablishing local populations that have been extirpated. Migratory forms are more fecund and larger than smaller non-native brook trout, potentially reducing the risks associated with hybridization (Reiman and McIntyre 1993). The greater fecundity of these larger fish enhances the ability of a population to persist in the presence of introduced fishes.

B. Critical Habitat

1. UW Chinook Salmon

Critical habitat for UW chinook salmon has not yet been designated by NMFS, but was proposed on March 9, 1998 (63 FR 11482). Proposed critical habitat for UW chinook salmon encompasses its current freshwater and estuarine range, including all waterways, substrate, and adjacent riparian zones below longstanding, impassible, natural barriers. This proposed critical habitat excludes historic UW chinook salmon habitat above some large, currently impassable dams such as Cougar Dam on the South Fork McKenzie River and Dexter Dam on the Middle Fork Willamette River (March 9, 1998; 63 FR 11482).

UW chinook salmon's life cycle can be separated into five essential habitat types: (1) juvenile summer and winter rearing areas; (2) juvenile migration corridors; (3) areas for growth and development to adulthood; (4) adult migration corridors; and (5) spawning areas. Areas 1 and 5 are often located in small headwater streams, while areas 2 and 4 include these tributaries as well as mainstem reaches and estuarine zones. Growth and development to adulthood (area 3) occurs primarily in near- and off-shore marine waters, although final maturation takes place in freshwater tributaries when the adults return to spawn. Within all of these areas, essential features of UW chinook salmon critical habitat include adequate: (1) Substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions (March 9, 1998; 63 FR 11482).

2. Bull Trout

In its final rule listing the Columbia River DPS of bull trout on June 10, 1998 (63 FR 31674), USFWS found that the designation of critical habitat was not determinable based on the best available information. Thus, bull trout critical habitat is not proposed or designated at this time.

IV. Evaluating Proposed Actions

The standards for determining jeopardy are set forth in Section 7(a)(2) of the ESA as defined by 50 C.F.R. Part 402 (the consultation regulations). The Services must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the following: (1) Defining the biological requirements of the listed ESU/DPS; (2) describing the current status of the listed ESU/DPS and their habitats under the environmental baseline; (3) evaluating the effects of the proposed action on the listed ESU/DPS; (4) considering the cumulative effects on the listed ESU/DPS; and (5) determining if the proposed action, together with the cumulative effects, is likely to jeopardize the continued existence of the listed ESU/DPS or result in the destruction or adverse modification of its designated critical habitat. The way NMFS applies these steps is described in more detail in Attachment 2.

This analysis is set within the dual context of the species' biological requirements and the existing conditions under the environmental baseline. The analysis takes into consideration an overall picture of the beneficial and detrimental activities taking place within the action area. If a jeopardy or destruction/adverse modification of critical habitat determination is made, then the Services must identify any reasonable and prudent alternatives to the proposed action.

A. Biological Requirements

As noted above, the first step in the method the Services use for applying the ESA standards of section 7 (a)(2) to listed salmonids is to define the species' biological requirements that are most relevant to each consultation. The Services also consider the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, the Services start with the information used to make their determinations to list the particular species for ESA protection (such as the chinook salmon status review, Meyers et al. 1998), and then consider any new data that are relevant to those determinations.

The relevant biological requirements are those necessary for the listed species to survive and recover to naturally-reproducing population levels at which protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed species, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

For this consultation, the Services find that the biological requirements of UW chinook salmon and bull trout are best expressed in terms of: (1) characteristics of the subpopulations of listed UW chinook salmon and bull trout within the action area; and (2) environmental factors that define the habitat qualities necessary for survival and recovery of listed UW chinook salmon and bull trout within the action area. These characteristics are defined for UW chinook salmon in NMFS (1996, 1999) and for bull trout in USFWS (1998).

B. Environmental Baseline

1. UW Chinook Salmon Population Baseline

The combined historic annual run size of spring chinook salmon in the Willamette and Sandy Basins (i.e., Upper Willamette ESU plus part of Lower Columbia ESU) is estimated to have been several hundred thousand adults (ODFW 1995). The Oregon Fish Commission estimated that the largest UW chinook salmon run into the McKenzie River Subbasin for years they had data was approximately 46,000 adults in 1941. This estimate was based on an assumption that 39 percent of the UW chinook salmon adults over Willamette Falls were bound for the McKenzie (Mattson 1948, USACE 1995).

Because of the strong hatchery influence on McKenzie River spring chinook since the 1940s, the following population trends reflect combined abundances of hatchery and naturally produced fish (thus the term “UW chinook salmon” is not used except where appropriate). The estimated run size of spring chinook into the McKenzie Subbasin from 1945-60 was about 18,000 adults, with a high of 38,000 in 1953 and a low of 6,000 in 1950 (USACE 1995). Since 1970, estimated annual returns of spring chinook adults to the McKenzie River averaged 5,861 fish from 1970 to 1979, 6,183 fish from 1980 to 1989, and 6,480 fish from 1990 through 1998. From 1970 through 1998, the spring chinook adult returns to the McKenzie River have comprised from 10.9 percent (1984) to 25.5 percent (1993) of the estimated escapement of spring chinook over Willamette Falls (Jeff Ziller, ODFW, Springfield, personal communication, September 1999). Within the McKenzie Subbasin, the annual returns of spring chinook adults above Leaburg Dam at river mile 35 averaged 2,599 fish from 1970 to 1979, 2,493 fish from 1980 to 1989, and 2,950 fish from 1990 through 1998, or 40-45 percent of the total spring chinook returning adults to the McKenzie. The abundance of naturally produced spring chinook (UW chinook salmon) adults above Leaburg Dam averaged approximately 1,056 fish from 1994 through 1998.

At present the only significant natural production of UW chinook salmon occurs in the McKenzie River Subbasin (final listing rule, 64 FR 14308). The upper watershed (i.e., above Leaburg Dam) is managed by ODFW as a natural production area by minimizing the escapement of hatchery produced adults above the dam. Natural spawning occurs both above and below the dam but is probably concentrated above it (ODFW 1995). UW chinook salmon redd counts from aerial surveys in the McKenzie River and redd counts from the Carmen-Smith spawning channel (located just below the impassable Trail Bridge Dam at river mile 78) both indicate a fluctuating but strong level of natural spawning from the mid 1960's to the present above Leaburg Dam (ODFW 1999).

Approximately 30 percent of the spawning distribution occurs in the mainstem McKenzie River below the confluence with the South Fork (river mile 58), 60 percent of spawning occurs in headwater areas above the confluence with the South Fork up to Trail Bridge Dam (i.e., between river miles 58 and 78), and 10 percent of the current spawning distribution occurs in the South Fork of the McKenzie River (USACE 1995). Thus the McKenzie Project (river mile 73.5) is located within the most productive UW chinook salmon spawning area in the entire Willamette Basin. UW chinook salmon spawning occurs in the immediate vicinity of the project, according to observations by ODFW staff. The project’s power canal provides elements of good rearing habitat (e.g., side channel habitat), for juvenile UW chinook salmon. Adult UW chinook salmon have also been observed in the tailrace, probably due to the attraction flow from the draft tube and/or potential spawning habitat within the tailrace.

2. Bull Trout Population Baseline

Bull trout were historically found throughout much of the Willamette Basin, including the North and

South Santiam Rivers, the Clackamas River, Middle and North Forks of the Willamette River and the McKenzie River (Buchanan et al. 1997). With the exception of a population that persists in the McKenzie River and reintroduced individuals in the Middle Fork Willamette River above Hills Creek Reservoir, bull trout have been extirpated from the Willamette Basin. Reasons for the decline of bull trout in the Willamette Basin include habitat degradation, passage barriers, overharvest, chemical treatment projects, and hybridization and competition with non-native brook trout (Ratliff and Howell 1992).

Based on the presence of Cougar and Trailbridge Dams as barriers, USFWS recognizes three subpopulations of bull trout in the McKenzie River Basin as follows: (1) McKenzie River and tributaries from the mouth up to Trailbridge Dam; (2) McKenzie River and tributaries above Trailbridge Dam; and (3) South Fork McKenzie River, upstream of Cougar Reservoir. Mature bull trout in the entire McKenzie River system are suspected to number fewer than 300 individuals.

In the mainstem McKenzie River subpopulation, bull trout are known to spawn only in Anderson and Olallie Creeks, both of which are upstream of the McKenzie Project. ODFW surveys in 1999 indicate a stable bull trout population in Anderson Creek, with as many as 242 mature bull trout and approximately 80 redds; Olallie Creek has a smaller spawning population with only nine redds detected in 1999 (Jeff Ziller, ODFW, Springfield, personal communication, September 1999). The project's power canal provides elements of good rearing habitat (e.g., side channel habitat) for juvenile bull trout. Adult bull trout migrate throughout the McKenzie River and may be found anywhere in the mainstem, as far down as the McKenzie's confluence with the Willamette River, where an individual bull trout was recently caught by ODFW.

3. UW Chinook Salmon and Bull Trout Habitat Baseline

Adult UW chinook salmon in the upper McKenzie River migrate past Leaburg Dam and into the upper basin in early summer, then hold in deep holes in the mainstem until spawning in September. Approximately 90 percent of these fish spawn in the mainstem, while the remainder spawn in tributaries (ODFW 1999). Rearing habitat within the action area for juvenile UW chinook salmon is provided by side channels and river margins along the mainstem, as well as the lower reaches of tributaries (Willamette National Forest [WNF] 1995). Thus the mainstem McKenzie River provides by far the most important habitat for UW chinook salmon within the action area. Within the action area, bull trout also use the mainstem for rearing, foraging, and migration, but spawning is restricted to tributaries (WNF 1995).

While the upper mainstem of the McKenzie River, including the action area, may appear to be relatively pristine, a number of studies have shown that it has been degraded during the last several decades. Minear (1994) found that between 1949 and 1986, the number and total length of side channels along the mainstem within the action area declined, indicating possible channel downcutting and abandonment of side channels. Sedell et al. (1992) found that larger substrates were more abundant in the upper mainstem in 1991 than in 1937, indicating that bedload coarsening has occurred within the action area. This is most likely the result of sediment interception by the Carmen-Smith-Trail Bridge Dams. The Willamette National Forest (WNF 1995) also notes these dams intercept large woody debris, resulting in simplification of stream structure through loss of scour sources, flow deflection, and sediment storage capability. Minear (1994) and WNF (1995) found that simplification of stream structure has occurred in the last several decades within the action area and immediately downstream due to reduced quantities of large woody debris, channelization by riprap and roads, and alteration of riparian vegetation. Degradation of riparian areas along the mainstem within the action area has, and is, occurring due to recreation, primarily camping (WNF 1995).

The tributaries within the action area, such as Deer Creek, Anderson Creek, and Olallie Creek (Lost Creek is not within the action area - see "Action Area" below), are also important for both UW chinook salmon and bull trout, especially bull trout since apparently this species does not spawn in the mainstem. UW chinook salmon are known to spawn in lower Deer Creek (WNF 1995). Aquatic habitats in tributaries within the action area have been degraded to a greater degree than in the mainstem, primarily by land management activities such as timber harvest and road construction. The resulting landslides, loss of riparian cover, and stream simplification has degraded physical habitat structure as well as water quality. Other human activities such as dispersed recreation have also contributed to this degradation (WNF 1995).

C. Action Area

The "action area" is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." (50 CFR 402.02). The effects of the proposed licensing of the McKenzie Project, including construction of new facilities required by the license as well as continued operation and maintenance of existing facilities, on UW chinook salmon and bull trout are concentrated in the area containing the power canal, powerhouse, and tailrace. However, direct and indirect effects extend a short distance downstream because the project potentially affects water temperature and turbidity. In addition, direct and indirect effects extend upstream because the project potentially affects spawning distribution of UW chinook salmon and bull trout by disrupting upstream migration of adult fish. The action area is thus the mainstem of the upper McKenzie River from the U.S. Geological Survey (USGS) flow gage at (river mile 70) to the project (river mile 73.5), and all habitat accessible to UW chinook salmon and bull trout upstream of the project (i.e., mainstem McKenzie River up to Trail Bridge Dam, and tributaries such as Deer Creek, Anderson Creek, and Olallie Creek).

V. Analysis of Effects on Listed Species and Critical Habitat

The proposed action is the licensing of the McKenzie Project by FERC, which will require the construction of new facilities, as well as the operation and maintenance of both the existing and new facilities. The license may be in effect for up to 50 years. The likely effects of this action on the listed species can be broadly categorized as: (1) direct effects on fish; (2) effects on fish habitat, and (3) effects on UW chinook salmon critical habitat. These are treated separately below.

A. Direct Effects on Listed Fish

The proposed action will likely result in mortality, injury, or harassment of downstream-migrating juvenile UW chinook salmon and juvenile bull trout by entrainment from the power canal through the turbine until the proposed juvenile fish screens and bypass are installed and operating correctly. Even during the driest months of the year, the project diverts up to four percent of the McKenzie River; the project operates on 41 cfs, and the monthly average flows at the USGS gage three miles below the project from 1964-1987 for the four driest months of the year (July-October) ranged from slightly over 1000 cfs to about 1500 cfs (Draft Application 1994). However, the power canal provides rearing habitat for juvenile UW chinook salmon and juvenile bull trout, thus the project may entrain a disproportionately high number (i.e., more than four percent) of juveniles in the river because many of them are attracted to the rearing habitat and then eventually entrained.

The McKenzie project is fitted with a Francis-type turbine, which is known to cause high mortality of juvenile salmonids by entrainment. Studies at small, low-head projects with Francis-type turbines have shown mortality rates of 13 to 28 percent of entrained juvenile chinook (Franke et al. 1997); these results were based on the mortality rate one hour after entrainment, and thus do not include delayed mortality, injury, stress, or other delayed effects. Juveniles entrained by the McKenzie Project that are not immediately killed may eventually die as a result of entrainment. Survivors are likely injured during entrainment, and subjected to high stress and disorientation in the tailrace, making even the uninjured fish more susceptible to predation and disease. Thus the project may result in mortality, injury, or stress of all entrained juvenile UW chinook salmon and juvenile bull trout, and this will continue at least until the juvenile fish screens and bypass are installed and operating correctly.

A reduced level of harm or harassment of juveniles may occur after installation of the proposed juvenile fish screens and bypass, which FERC proposes to require completion of within 18 months of the issuance of the license in a manner consistent with NMFS' criteria (September 20, 1999, letter from FERC to NMFS). Even with properly operating screens and bypass, fish will occasionally become impinged on the screens or injured in the bypass system, thus the system poses the risk of continued harm to juvenile UW chinook and bull trout. Additional harm could occur in the event of malfunction, or if the facilities are not operating as expected, resulting in possible impingement on the screens and/or injury while going through the bypass system. The potential for entrainment of juvenile UW chinook salmon and juvenile bull trout into the turbine after the proposed juvenile facilities are installed is extremely low unless the screens are damaged or removed.

The proposed action will likely result in mortality, injury, or harassment of all adult bull trout by entrainment from the power canal through the turbine until the proposed juvenile fish screens and bypass are installed and operating correctly. After these facilities are installed, adult bull trout moving downstream are unlikely to be affected by the project. The proposed action has the potential to attract upstream-migrating adult UW chinook salmon and adult bull trout into the tailrace, subsequently causing spawning migration delay, until the proposed tailrace barrier is installed and operating correctly. The potential for migration delay of adult UW chinook salmon and adult bull trout due to false attraction into the tailrace after the proposed tailrace barrier is installed is very low unless it is damaged to the extent that adults can get through it.

In summary, mortality, harm and harassment of juvenile and adult UW chinook salmon and bull trout has been, and is currently, occurring due to the operation of this project, primarily through entrainment of downstream-migrating juveniles (and possibly adult bull trout) into the turbine and delay of upstream-migrating adults from false attraction into the tailrace. Implementation of the proposed action (i.e., issuance of the new license by FERC) will result in a continuation of these direct effects until the improvements required by the new license are installed. These improvements will substantially reduce the mortality, harm and harassment of juvenile and adult UW chinook salmon and bull trout by this project, but it is likely that some harm of juveniles will still be caused by the project after the improvements are installed due to impingement on the screens and bypass problems, especially in the event of malfunction or damage.

B. Effects on Habitat of Listed Fish

The proposed action will likely result in adverse effects to habitat, which would harm UW chinook salmon and bull trout, through the continued operation of the project, as well as the construction of new facilities required by the new license. The project's small capacity (maximum of approximately 4 percent of streamflow at diversion point), run-of-river operation, and short diversion bypass (<2000 feet) results in minimal effects on instream flows and water quality in the McKenzie River within the action area. The proposed action calls for continuing current power operations at the project. Some sedimentation and riparian damage is likely to occur during the construction of the new fish passage facilities (juvenile screens, juvenile bypass system, and adult tailrace barrier). Water temperature is likely to be affected by the continued operation of the project, independent of the construction and operation of the new fish passage facilities. Water temperature effects are not likely to extend outside the forebay and tailrace, but will continue as long as the project is in operation. However, these effects are expected to be minor and temporary, and will be minimized by a plan proposed as part of the action. The plans for screening and bypass facilities will be reviewed and approved by the Services prior to construction. This review will ensure that the effects of construction will be minimized to the maximum extent possible. The effects of the current operation of the project on the habitat of UW chinook salmon and bull trout are currently localized and very small-scale, and these effects will be continued, but not increased under the proposed action. In addition, there will be minor, temporary habitat effects due to construction of new fish passage facilities.

C. Effects on UW Chinook Proposed Critical Habitat

The proposed action would affect the following essential features of UW chinook salmon proposed critical habitat: (1) substrate, (2) water quality, (3) water temperature, (4) riparian vegetation, and (5) safe passage conditions. Substrate, water quality, and riparian vegetation are likely to be affected by construction of new facilities due to ground disturbance and clearing, resulting in some erosion, turbidity, and possible sedimentation. Due to the small size of the new facilities and their location in the forebay and tailrace (i.e., not in the main channel), these effects are expected to be very limited both spatially (not extending outside the forebay and tailrace) and temporally (not extending beyond the construction period). Water temperature is likely to be affected by the continued operation of the project, independent of the construction and operation of the new fish passage facilities. Water temperature effects are also expected to be very limited spatially (not extending outside the forebay and tailrace), but will continue as long as the project is in operation. Passage conditions will be improved by the proposed action because of the construction and operation of the new fish passage facilities. In summary, the effects of the proposed action may degrade some UW chinook salmon and bull trout habitat indicators (USFWS 1998, NMFS 1999), including the UW chinook salmon critical habitat essential features mentioned above. However, this degradation is expected to be at a far smaller spatial scale than the action area, and in most cases the temporal scale is expected to be limited to the construction period for the new fish passage facilities.

VI. Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being (or have been) reviewed through separate section 7 consultation processes. Therefore, these actions are not considered cumulative to the proposed action.

Information on specific activities planned or foreseeable on non-Federal land was not provided in the BA. The action area is approximately three percent non-federal land (WNF 1995). The Services are not aware of any future new (or changes to existing) State and private activities within the action area. The Services assume that management impacts from non-Federal activities which have degraded or hindered recovery of anadromous fish habitat will continue in the short-term at similar intensities as in recent years. This assumption may be conservative in the long-term, given development of non-Federal conservation programs, such as the Oregon Plan for Salmon and Watersheds, and possible development of habitat conservation plans with non-Federal entities to fulfill the requirements of section 10 of the ESA.

VII. Conclusion

After reviewing the current status of UW chinook and bull trout, the environmental baseline for the action area, the effects of the proposed FERC license for the McKenzie project, and the cumulative effects, it is the Services' Biological Opinion that the McKenzie project, as proposed, is not likely to jeopardize the continued existence of UW chinook or bull trout, and is not likely to destroy or adversely modify proposed critical habitat for UW chinook. The Services conclude that FERC's issuance of a license for the McKenzie project will not reduce appreciably the likelihood of both the survival and recovery of UW chinook or bull trout in the wild by reducing the reproduction, numbers or distribution of these species. This conclusion is based on the following aspects of the Services' analysis of project impacts: (1) the effect of the existing project on reproduction of UW chinook and bull trout will be significantly reduced by the implementation of screening and bypass facilities, improving the quality of rearing habitat in the power canal; (2) the number of UW chinook and bull trout expected to be affected by the project is small; and (3) the action area represents a small portion of the distribution of the UW chinook and bull trout.

NMFS concludes that FERC's issuance of a license for the McKenzie project will not diminish appreciably the value of proposed critical habitat for both the survival and recovery of UW chinook salmon. This conclusion is based on the small-scale, and in most cases temporary, expected alterations due to the proposed action on the essential features of UW chinook salmon proposed critical habitat.

VIII. Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. ODFW has made recommendations to enhance habitat in the project power canal. The Services support these measures to improve the quality of rearing habitat for juvenile UW chinook salmon and bull trout, which include: (1) placement of large woody debris complexes in the pond area of the power canal to provide escape cover from predators, (2) placement of large woody debris along the margins of the power canal to provide structural diversity and predation refuge, and (3) planting native conifer trees on the south bank of the power canal to provide shade and maintain cool water temperatures in the power canal. In order for the Services to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Services request notification of the implementation of any conservation recommendations.

IX. Reinitiation of Consultation

This concludes formal consultation on the action outlined in FERC's request for consultation on the McKenzie project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take specified in the Incidental Take Statement is exceeded, any operations causing such take must cease pending reinitiation.

Rebuilding the diversion dam, or any modification of the diversion dam area, would constitute a modification of the action that may affect listed species in a way not previously considered, thus requiring immediate reinitiation of consultation by FERC. We emphasize that failure to implement the terms and conditions in the Incidental Take Permit in accordance with specified timelines would also constitute a modification of the action that may affect listed species in a way not previously considered, thus requiring immediate reinitiation of consultation by FERC. FERC is responsible for ensuring the implementation of the terms and conditions in the Incidental Take Statement of this opinion.

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XI. Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by regulation as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

NMFS has not completed a 4(d) rule for UW chinook salmon. However, the statutory obligation for Federal agencies to comply with an incidental take statement provided in a Biological Opinion is independent from the section 9 take prohibition (NMFS 1998).

An incidental take statement specifies the amount or extent of any authorized incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

The measures described below are non-discretionary, and must be undertaken by FERC so that they become binding conditions of any permit or license issued to Mr. Bigelow for the exemption in section 7(o)(2) to apply. FERC has a continuing duty to regulate the activity covered by this incidental take statement. If the FERC (1) fails to assume and implement the terms and conditions or (2) fails to require Mr. Bigelow to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, FERC or Mr. Bigelow must report the progress of the action and its impact on the species to the Services as specified in the incidental take statement [50 CFR §402.14(i)(3)].

A. Amount or Extent of Incidental Take

For the purposes of this Opinion, incidental take is defined as take of UW chinook salmon and bull trout individuals (fertilized eggs, fry, juveniles, or adults) that results from the construction and operation of the McKenzie Project after the issuance of the hydroelectric license for the project by FERC. The incidental take is expected to be in the form of harm, harassment, and mortality to UW chinook salmon and bull trout individuals from entrainment into the project turbines prior to construction of fish screens, migration delays for upstream migrating adult UW chinook salmon and bull trout, sediment effects, temperature effects, in-water work, and the operation of new fish passage facilities. The amount or extent of incidental take resulting from the proposed action is difficult to quantify due to the difficulty in finding individuals that have been killed or otherwise taken by the project. Furthermore, even if dead or injured individuals are found in the project area, determining the cause of the mortality or injury may be difficult. Effects of the operation of a small project such as this one are difficult to quantify in the short term, and are not expected to be measurable as long-term effects on the species' habitat or population levels. Therefore, even though the Services expect some low level incidental take to occur due to the actions covered by this Biological Opinion, the best scientific and commercial data available are not sufficient to enable the Services to estimate a specific amount of incidental take to the species. In instances such as these, the Services designate the expected level of take as "unquantifiable." Based on the information in the BA, the Services anticipate that an unquantifiable amount of incidental take of UW chinook salmon and bull trout could occur as a result of the actions covered by this Biological Opinion. In the accompanying Biological Opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species.

B. Reasonable and Prudent Measures

The Services believe that the following reasonable and prudent measures are necessary and appropriate to minimize take of bull trout and UW chinook salmon:

1. Minimize the effects of the operation of the project on water temperatures to prevent take from chronic or acute physiological effects to listed fish.

2. Minimize the effects of in-water work associated with the project to prevent direct mortality and injury of listed fish from construction activities.

3. Minimize the effects of the operation of the project on fish passage and migration to prevent mortality

and injury of listed fish from entrainment, impingement, migration delay, or other passage problems.

4. Document the continued operation of fish protection components of the project to ensure incidental take of listed fish does not exceed predicted levels.

C. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, FERC must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline monitoring requirements. These terms and conditions are non-discretionary.

1.a. Operate the project in continuous run-of-river mode.

1.b. Existing riparian vegetation adjacent to the McKenzie River or project power canal shall not be removed for the implementation of any aspect of the license for the project.

2.a. All in-water work shall occur during the in-water work window for this area specified by ODFW at the time of construction.

3.a. Develop plans for the design, construction, operation, and maintenance of juvenile fish screens and bypass system at the penstock entrance and powerhouse, based on the conceptual plans included in the draft license application and NMFS' juvenile fish screening criteria (Attachment 1). These plans must minimize the adverse effects of construction, to the maximum extent possible. The plans must be consistent with NMFS' juvenile fish screening criteria, and they must receive approval from NMFS and USFWS before the screens and bypass are installed.

3.b. Complete installation of the juvenile fish screens and bypass system within eighteen months of issuance of license for the project by FERC.

3.c. Develop a study evaluating the effectiveness of the juvenile fish screens and bypass system. The study proposal must be approved by NMFS and USFWS within eighteen months of issuance of license for the project by FERC, and the study must be implemented during the first year of operation of the juvenile fish screens and bypass system. A final study report must be delivered to NMFS and USFWS within three years of license issuance.

3.d. Develop plans for the design, construction, operation, and maintenance of a tailrace barrier to upstream migrating adult UW chinook salmon and bull trout. These plans must minimize the adverse effects of construction, to the maximum extent possible, and receive approval from NMFS and USFWS before the tailrace barrier is installed.

3.e. Complete installation of the tailrace barrier within eighteen months of issuance of license for the project by FERC.

4.a. Provide an annual report to NMFS and USFWS by December 31 of each year after the license is issued documenting progress on the implementation of each Term and Condition in this Biological Opinion. A description of any progress on the implementation of the Conservation Recommendations should also be included in this report. The annual report should be sent to both addresses below:

Oregon Branch Chief
Habitat Conservation Division

National Marine Fisheries Service
525 NE Oregon Street, Suite 500
Portland, Oregon 97232

State Supervisor
Oregon State Office
U.S. Fish and Wildlife Service
2600 SE 98th Avenue, Suite 100
Portland, Oregon 97266